April Monthly Educational Module "The Lower Mississippi River Forecast Center's Historical River Flooding Events"

<u>Day 1</u>

This monthly module we are highlighting historical river flooding events in the Lower Mississippi River Forecast Center's area. For our first event, we are starting off with a BANG...the big Mississippi River Flood of 1927! Check out the graphics below to learn all about the cause and impacts from the 1927 Flood.

1927 Mississippi River Flood

Cause

- One of the most powerful natural disasters of the 20th century
- Caused by above normal rainfall between August 1926 and April 1927 leading to above normal flows over the entire MS River drainage area and flooding on the Cumberland, Tennessee, Ohio Rivers.
- By spring of 1927, the entire system was "FULL"
- Event climaxed in April 1927 when most of the MS River Basin received excessive rainfall



Cairo, IL, on March 25, 1927, crested 3.6 feet higher



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Arkansas City, AR 1927

1927 Mississippi River Flood

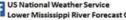
Impacts

- Record crests along the MS River with over 120 breaks in levees, as well as on MS River tributaries and the Atchafalaya River.
- 1927 Flood forced the approval of the Flood Control Act of 1928 which gave to the Federal government an active role in flood control and appointed the Army Corps. Of Engineers (COE) the responsibility of the MS River.
- COE designed and built levees, reservoirs, and floodways for flood control and management, as well as added more river gages.
- This also caused the MS River channel to be straightened
- Government now takes a more direct role in disaster relief, response, and recovery.
- The 1927 Flood still holds the record crests for the following locations on the MS River: Arkansas City, AR; Greenville, MS; Baton Rouge, LA; and Donaldsonville, LA.

1927 Flood Impacts	
Human Loss of Life	246
Displaced People	700,000
Financial Loss	\$347,000,000 in 1927 = \$4.4 billion in 1993 dollars
Structural Damage	137,000 buildings destroyed or damaged
Flooded Area	27,000 square miles
River Volume	2,662,000 cubic feet of water per second at Arkansas City









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Now, let's cover the 1953 Central Louisiana Flood! Check out the graphics below to learn more about this event, including where flooding occurred and who was affected. We will give you a hint...Our friends in the Lake Charles area will appreciate this module.

Sources:

USGS paper: http://pubs.usgs.gov/wsp/1320c/report.pdf

Pictures: LOUISiana Digital Library; "Lake Charles Flood 1953" article: http://www.scribd.com/doc/137084493/Lake-Charles-Flood-1953

1953 Central Louisiana Flood Cause Flooding occurred between April and June of 1953 in LA and adjacent states and was caused by continuous rounds of heavy rainfall. Two defined periods of heavy rainfall were between April 24th - May 5th and May 11th - 15th. Saturated soil conditions and higher streamflows from first event set the stage for the second event on May 18th, which had widespread heavy rainfall across the region with highest amounts of 14 to 25 inches across Central LA (pictured right).

1953 Central Louisiana Flood

Impacts

There were 12 fatalities, \$35 million in damages, 15,000 people left homeless. Flooding occurred along MS River tributaries, Whiskey Chitto Creek, Bayou Nezpique, and the Calcasieu, Mermentau, Boeuf, Amite, Comite Rivers in the LMRFC area, as well as the Neches and Sabine Rivers outside the area. Most of the record flooding was in central LA, with record breaking flooding on Whiskey Chitto Creek, 11.5 times the mean annual flood! And, the city of Lake Charles suffered the most damage in its history.

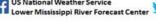
As a result to the 1953, the flood control levee on the north side of Lake Charles was built to protect the city from another significant river flood event. The 1953 Flood still holds the record flood crests at Mittie, LA, on the Whiskey Chitto Creek; Basile, LA, on Bayou Nezpique; and the following locations on the Calcasieu River: Glenmora, LA; Oakdale, LA; Oberlin, LA; Kinder, LA; and Old Town Bay, LA.



Automobiles submerged in flooded water



Chennault Air Force Base during the flood





Our next event is the 1963 Tennessee River Basin Flood. Check out the graphics below to learn more about what caused this event and how it impacted the Tennessee, Alabama, North Carolina, and Virginia areas.

Source: "Floods of March 1963 in Tennessee River Basin" Volumes I & II by Tennessee Valley Authority

1963 Tennessee River Basin Flood

- Three floods in two weeks caused widespread damage over much of the TN River basin during the first half of March in 1963.
- The first storm, averaging 3 inches across the basin, took place between March 5th and 6th, and led to bankfull and overbanking stages in some locations. It also set up saturated conditions for the second storm.
- The second storm was greater, averaging 4.2 inches over the entire TN Valley with hot spots of 6 inches, and it occurred a week later on March 11th-12th. Most of the significant flooding occurred here.
- A third storm sealed the deal for the upper Clinch River basin, where the heaviest rain fell over Clinch and Powell Rivers, averaging 2 inches with hot spots over 3 inches.
- Excessive rainfall in March of 1963 resulted in significant property damage for portions of TN, AL, NC, and VA; but, thankfully, not many lives were lost despite some streams and rivers reaching near or exceeding record crest stages at the time.



Clinch River at Richlands, VA during 1963 Flood



Major flooding along the Little Pigeon River near Sevierville, TN, on March 6, 1963



1963 Tennessee River Basin Flood

- A big contributing factor to the 1963 Flood was that most of the rain fell below tributary storage dams. Another factor was that uncontrolled portions of the TN River basin saw heavy flood damage whereas the controlled portions were spared from substantial flooding despite some minor to moderate flooding.
- The Sequatchie River near Whitwell, TN, Paint Rock River near Woodville, AL, the Flint River near Chase, and portions of the French Broad River basin reached new record flood stages; however, many points in the TN River basin did not. Despite not reaching record levels, many crests came close and caused major flooding along the upper Clinch River, other portions of the French Broad, parts of the Duck and Elk Rivers, and the Little Pigeon River near Sevierville, TN.
- Although many of these TN River tributaries saw major river flooding, TVA storage reservoirs on the main stem of the TN River helped to prevent flood heights and losses downstream, protecting cities like Knoxville and Chattanooga, TN. And even though several locations broke new records, newer records have been set since then. The 1963 Flood does not hold any record crests now; however, these crests are noted as historical and are used as references for forecasting purposes.



School bused flooded in Marshall, NC, along the French Broad River on March 6, 1963



Flint River at Chase, AL near crest during 1963 Flood

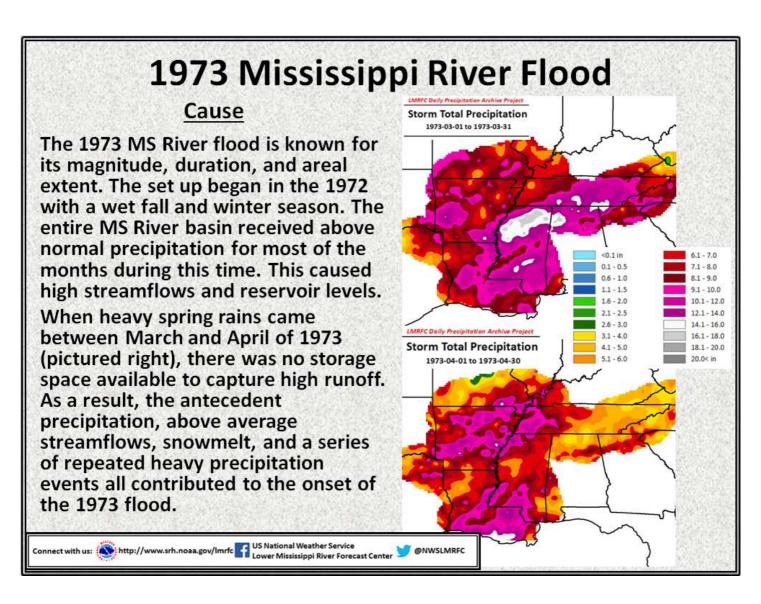


<u>Day 4</u>

The 1973 Mississippi River Flood is up next! Check out the graphics below to learn more about this flood event and how it impacted the Mississippi River and its tributaries.

Sources: "The 1973 Mississippi River Basin Flood: Compilation and Analyses of Meteorologic, Streamflow, and Sediment Data" by U.S. Department of the Interior and the U.S. Department of Commerce http://pubs.usgs.gov/pp/0937/report.pdf

"Flood of '73: Post-Flood Report" by New Orleans District of the U.S. Army Corps of Engineers



1973 Mississippi River Flood

Impacts

The 1973 MS River Flood caused 28 deaths, 50,000 people to be evacuated, and \$400 million in damages. It had the largest volume of water to flow down the MS River since 1927. Although there was record high flows, river stages were not quite as high as previous MS River floods.

High flows caused major flooding and significant sediment erosion, transport, and deposition. Crests along the MS River were sustained for consecutive days and many locations remained above flood stage for up to 3 months! Flooding on the MS River continued into June.

Flooding also occurred on MS River tributaries from backwater. MS River tributaries that were impacted include the St. Francis, White, Arkansas, Black, Yazoo, Big Black, Red and Ouachita Rivers, as well as on its distributary, the Atchafalaya River. Even the Bonne Carré Spillway and Morganza Spillway were operated.

Although many locations along the MS River exceeded the 1927 and 1937 MS River Floods, they have been replaced by the 2011 flood. The 1973 MS Flood does not hold any record crests on the MS River today, however, it does hold record crests on several tributaries, including the Atchafalaya River, Tensas River, Coldwater River, Tallahatchie River, and the Big Sunflower River.

The National Weather Service forecasts and warnings helped warn the public ahead of time, allowed for evacuations, and saved many lives and millions of dollars in financial losses.



Oil Refinery flooded along the Atchafalaya River Basin during the 1973 Mississippi River Flood



Old River Low Sill Control Structure during the 1973
MS River Flood

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We've got another Tennessee River Basin Flood for you! It's the 1977 Tennessee River Basin Flood! Check out the graphics below to learn all about this flood event.

1977 Tennessee River Basin Flood Cause The 1977 TN River basin flood was caused by two weather systems that moved across the area between April **Storm Total Precipitation** 1977-04-02 to 1977-04-05 2-5, 1977. Prior to event, the TN River basin saw below average precipitation for February and slightly above average precipitation for March. However, the storms in early April led to significant flooding due to the high rainfall amounts on uncontrolled watersheds. Widespread 5 to 10 inches of rain fell during April 3-5, 1977, over many of the watersheds in the central/eastern TN and southwestern VA areas. The heaviest rain occurred on April 4-5 and was concentrated over the northern part of the TN River Valley.

1977 Tennessee River Basin Flood

Impacts

Because the heaviest rain was concentrated over the northern part of the TN River Valley, the greatest damages occurred along the Clinch and Powell River basins. Damages totaled \$103.6 million in VA and \$20.2 million in TN. Thankfully, additional flood damages were prevented by TVA's flood control operations.

The most severe flooding occurred along the upper reaches of the Clinch River and the Powell River during April 4-6, 1977. Many of the points on these rivers exceeded previous record stages.

Significant flooding was also in the lower portions of the Nolichucky, Pigeon, and Little Pigeon Rivers, particularly in the Newport area, where the Pigeon River joins the French Broad.

Near record flooding occurred on the North, Middle and South Forks of the Holston River; and moderate flooding occurred over the remainder of the TN River basin but were less than the previous record flooding events. These portions include: Clinch River below Norris Dam, Holston River, and the east TN portion of the French Broad River.

Lastly, only minor flooding occurred on the Duck and Elk River basins as a result of the regulation by the Normandy and Tims Ford reservoirs. This prevented major flooding at Shelbyville, TN (on the Duck River) and Fayetteville, TN (on the Elk River)

The 1977 Flood still holds the record crests for the following locations: Cleveland, Speers Ferry, and Tazewell, on the Clinch River; and Jonesville and Arthur

on the Powell River.



Clinchport, VA on Clinch River during the 1977
Flood



HWY 31 in Sneedville, TN, flooded by the Clinch River

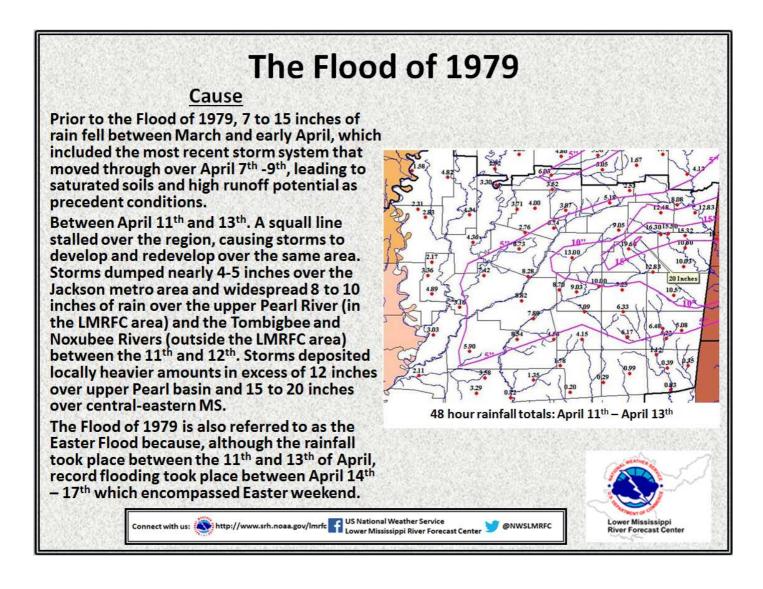
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<u>Day 6</u>

We are going to continue highlighting some of the historical river flood events with the Flood of 1979 that impacted the Jackson, MS, and Pearl River communities. To learn more about this event, check out the graphics below.



The Flood of 1979

Impacts

Flash flooding and river flooding impacted many locations in MS and AL as a result to the heavy rainfall between April $11^{\rm th}$ and $13^{\rm th}$.

Record flooding occurred on the Noxubee, Tombigbee, and Black Warrior Rivers outside the LMRFC area and the Pearl River in the LMRFC area. Flooding was occurring simultaneously in the entire LMRFC area with record flooding along the Yazoo, Leaf, Chickasawhay, Yockanookany, and Big Black River systems.

Inflows into the Ross Barnett Reservoir reached a peak of 162,000 cubic feet per second at midnight on April 16th, and the outflows reached a peak of 125,000 cubic feet per second on Easter morning on the 15th.

The rapid rise on the Pearl River contributed to the Pearl River at Jackson to crest at 43.25 feet on April 17th. Pearl River at Jackson was above flood stage prior to this event.

Damage was widespread across the Jackson area. Popular landmarks that were impacted from the 1979 flood include I-55, the Fairgrounds, the Coliseum, the Trade Mart, and the Waste Water Treatment Plant. Communities of Pearl and Flowood were threatened by the high river stages on the Pearl but spared most of the flooding damage. Flooding routed downstream causing record flooding along several points on the lower stem of the Pearl River.

In MS and AL, a total of 9 deaths and \$700 million in damages were a result to the 1979 Flood. In the Jackson area alone, 15,000 people were evacuated and an estimated \$500 million was totaled for the damages in the metro area. Downstream flooding was less severe but still significant.

The U.S. Army Corps of Engineers said this was a 500 to 1,000 year flood event. The 1979 Flood still holds the record flood stages at the following locations: Kosciusko and Ofahoma on the Yockanookany; and Philadelphia, Edinburg, Carthage, Lena, Ratliff's Ferry, Jackson, Rockport, Columbia, Bogalusa on the Pearl River.



Downtown Jackson during the 1979 Flood



The Coliseum flooded during 1979 Flood

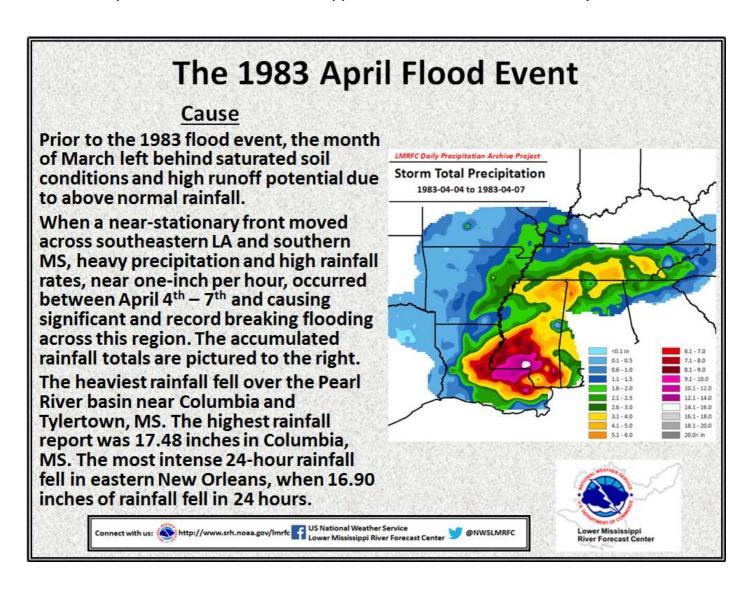
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<u>Day 7</u>

Up next is the 1983 Flood in southern Mississippi and southeastern Louisiana! Check out the graphics below to learn all about this flood event.

Sources: Sources: "Post-Flood Report Flood of April 1983 Pearl River Basin" by the U.S. Army Corps of Engineers Vicksburg District

"Floods of April 1983 in Southern Mississippi and Southeastern Louisiana" by the U.S.G.S.



The 1983 April Flood Event

Impacts

The 1983 Flood caused record flooding and extensive damage to lower portion of the Pearl River and Amite River basins. The most extensive damage was along and near the Pearl River basin in Columbia, MS, Tylertown, MS, and Slidell, LA.

A total of \$12,108,000 damages were seen just within the Pearl River basin. Several hundred homes, many mobile homes, downtown businesses, shopping centers, and numerous roads and bridges were damaged or destroyed by overbanking from the Pearl River. In Slidell, I-10 was shut down for 4 days! And Pearl River, LA, on the Pearl River exceeded the 100 year flood frequency, as did the Bogue Chitto River near Bush, LA.

The 1983 Flood still holds the record for the following locations in the LMRFC area: Denham Springs, Bayou Manchac, and Port Vincent along the Amite River; Liverpool and Holden along the Tickfaw River; Baptist on the Natalbany River; Folsom on the Tchefuncte River; Pearl River on the Pearl River; Bush on the Bogue Chitto River, and Brooklyn on the Black Creek. It also held the record crest for Strong River at D'Lo, MS, until the most recent flood event this past April.



Flooding in Slidell, LA during the 1983 Flood

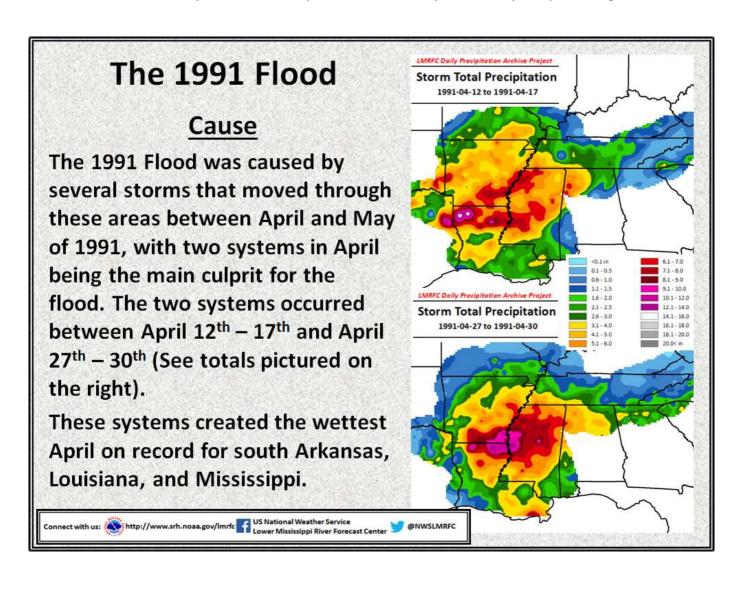


Flood Damage at Columbia, MS after 1983 Flood

<u>Day 8</u>

Next up, we are highlighting the 1991 Flood event in the Ouachita, Black, Red, and Yazoo River basins. Check out the graphics below to learn more about the causes and impacts of this flood.

Sources: "Post Flood Report Flood of April/June 1991" by U.S. Army Corps of Engineers



The 1991 Flood

Impacts

Flooding occurred between April-June, 1991 along the Ouachita, Black, Red, Yazoo River Basins, and their tributaries.

There was a total of 25 deaths that occurred from this flood event and almost 9, 000 homes and businesses were flooded.

Damages from this flood event totaled \$351 million within the Vicksburg Corps District and nearly 4,219,000 acres were inundated. This flood also impacted agricultural lands and economy significantly because the flooding occurred during both the planting season and the growing season.

Flood control projects by the Corps helped prevent nearly \$1 billion in damages during this event

The 1991 Flood still holds the flood record for the following locations: Lake Bistineau on Bayou Dorcheat; Columbia Lock and Dam on the Ouachita River; Lake Claiborne and Lake D'Arbonne on Bayou D'Arbonne; Fort Necessity on Bouef River; Arkabutla Dam and Marks on Coldwater River.



Flooding from the Big Sunflower River in the 1991 Flood



Flooding at Jonesville Lock and Dam in Louisiana



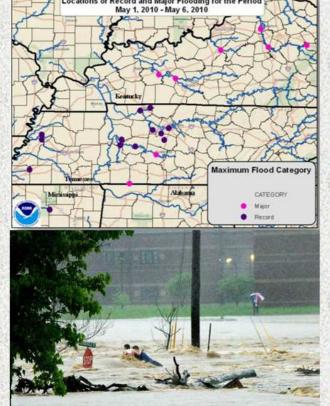
<u>Day 9</u>

We are highlighting the 2010 Nashville Flood next. To learn about this flood, its causes, and its impacts, check out the graphics below.

Source: Service Assessment: "Record Floods of Greater Nashville: Including Flooding in Middle Tennessee and Western Kentucky, May 1-4, 2010"

Cause The 2010 Nashville Flood event was 2010 Nashville Flood caused by record breaking rains over the Kentucky and Tennessee Valley region. Western and Middle TN were hit the hardest with local amounts of 18-20 inches to the south and west of the Rainfall Analysis from the River Forecast Center 48 Hour Multi-Sensor Precipitation Estimates 7 AM CDT May 1, 2010 - 7 AM CDT May 3, 2010 Greater Nashville area. The event began with heavy rain on Saturday, May 1st. Numerous flash floods occurred and rivers quickly exceeding their banks. The second period of heavy rain fell over much of the same area on May 2nd, resulting in repeated flash flooding and increased river flooding up to major and record levels. The additional heavy rainfall on May 2nd caused river flooding to continue through May 4th. Unlike other events, the antecedent conditions to the 2010 Nashville flood were drier than normal; however, the above normal rainfall totals over this 2 day period broke the record for the wettest May on record with 10-20 inches of rainfall within a 36-hour window.

2010 Nashville Flood



Flooding in Sumner County TN during 2010 Flood

Impacts

As a result to record breaking rains, the 2010 Nashville Flood encompassed flash flooding and river flooding along the Cumberland River and its tributaries, as well as widespread record flooding across mid-Mississippi and Lower Ohio River Valleys.

The 2010 Nashville flood caused 26 fatalities and property damage in excess of \$2 billion in the Greater Nashville area alone.

Because the heaviest rain occurred in the uncontrolled (no dams or flood control structures in place) portions of the Cumberland tributaries, record flooding occurred on its tributaries and a significant amount of runoff from the rainfall went directly into the Cumberland River.

If the rain would have been shift further upstream of the Cumberland River, reservoirs could have helped to hold back water from downstream locations.

As a result to this event, the National Weather Service, the U.S. Army Corps. of Engineers, and the USGS entered "flood fight" from Saturday, May 1st to Tuesday, May 4th.

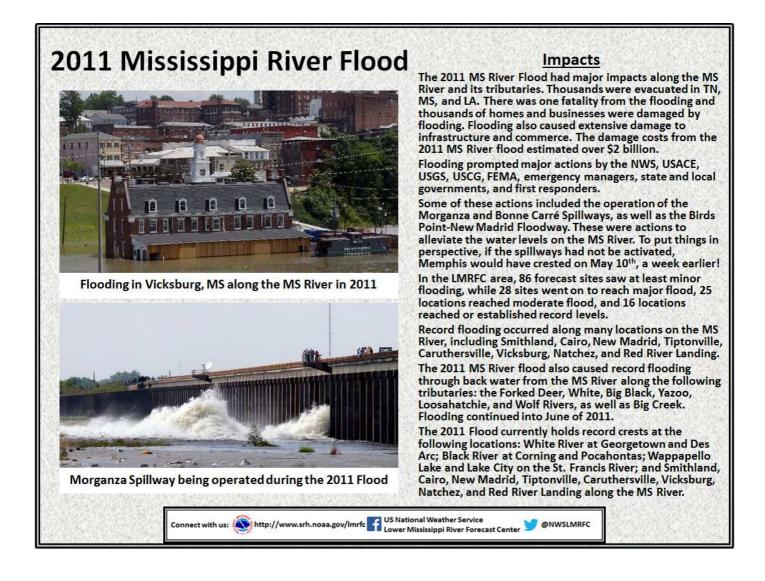
This event generated a combined total of 21 major and record river floods at NWS river forecast points: 9 in the LMRFC area and 12 in the OHRFC area.

The 2010 Flood still holds the flood record for the following locations: Etta on the Little Tallahatchie River; Dyersburg and Halls on the Forked Deer Rivers; Arlington on the Loosahatchie River; La Grange on the Wolf River; Centerville and Hurricane Mills on the Duck River; and Lobelville on the Buffalo River.

This is our last historical flood event and we are going out with a BANG! For our last historical river flood event, we are highlighting the BIG 2011 Mississippi River Flood! To read more about this flood and learn about its causes and impacts, check out the graphics below.

Sources: Service Assessment: "Spring 2011 Middle & Lower Mississippi River Valley Floods" http://www.commercialappeal.com/photos/galleries/day-pictures---may-13-2011/39087/ http://davidbrin.blogspot.com/2011/05/river-will-win.html

2011 Mississippi River Flood Cause Prior to the 2011 MS River flood. there was above average rainfall, Total Storm Precipitation and Flood Events from April 15 - May 29, 2011 as well as record snowmelt along the MS and Ohio River Valleys, which left many swollen rivers. In late April and early May 2011, two major storm systems brought record rainfall over the MS River basin (Pictured to the right). In a 2 week period some areas saw in excess of 20 inches of rainfall. The hardest hit areas include eastern Oklahoma, the middle MS Valley, and the Ohio River Valley. All of this rainfall drained into the Category Ohio and MS River systems; however, these systems were Moderate already full from the winter Major snowmelt and wet spring and resulted in major and record flooding along the Ohio and MS River basins.



We hope you all have enjoyed learning about many of the historical river flood events in the LMRFC's history, and we want to welcome you to share your photos and stories of historical river flooding as well. If you have any pictures or stories from river flooding that you would like to share, please feel free to email them to us at SR-LMRFC.Webmaster@noaa.gov. Thank you!